**Citation:**

Papanikolaou Y, Fulgoni VL 3rd. Bean consumption is associated with greater nutrient intake, reduced systolic blood pressure, lower body weight, and a smaller waist circumference in adults: Results from the National Health and Nutrition Examination Survey 1999-2002. *J Am Coll Nutr*. 2008 Oct; 27 (5): 569-576.

**PubMed ID:** 18845707

**Study Design:**

Cross-Sectional Study

**Class:**

D - Click here for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To examine the impact of bean consumption on physiological parameters and overall nutrient intake in adults who participated in the NHANES 1999-2002 surveys.

**Inclusion Criteria:**

Participants in the 1999-2000 and 2001-2002 NHANES surveys.

**Exclusion Criteria:**

- Those with unreliable diet records
- Pregnant/lactating females.

**Description of Study Protocol:**

**Recruitment**

Subjects data was obtained from NHANES data base.

**Design**

- Three groups of bean consumers were identified:
  - Baked bean (BB) N=168 (96 males, 72 females)
  - Variety bean (VB) N=750 (391 males, 359 females)
  - Variety bean or baked bean (VBBB) N=915 (485 males, 430 females)
- These groups were compared with non-bean eaters for risk factors:
  - Elevated blood pressure ≥130mmHg SBP and ≥85mmHg DBP

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- LDL cholesterol (≥100mg/dL)
- Triglycerides (≥150mg/dL)
- Fasting blood glucose (≥110mg/dL)
- Waist size (≥102cm for men and ≥110cm for women)
- Low HDL cholesterol (<40mg/dL for men and <50mg/dL for women)
- Likelihood of being overweight BMI ≥25kg/$m^2$ or obese BMI ≥30.0kg/$m^2$.

**Dietary Intake/Dietary Assessment Methodology**

24-hour diet recall obtained during NHANES.

**Statistical Analysis**

- Data from two consecutive NHANES (1999-2000 and 2001-2002) were combined
- Physiologic parameters of bean consumers vs. non-consumers were examined after adjustment for age, gender, ethnicity and energy intake
- Logistic regression was used to determine the odds ratio (OR) of risk factors between bean consumers and non-consumers
- Means and standard errors were calculated for variables of interest.

**Data Collection Summary:**

**Timing of Measurements**

One time measurement of 24-hour recall and physiologic indicators.

**Dependent Variables**

- Variable 1: Blood pressure
- Variable 2: BMI
- Variable 3: Triglycerides
- Variable 4: LDL- and HDL-cholesterol
- Variable 5: Waist size.

**Independent Variables**

Bean consumption (baked bean, variety bean and variety or baked bean).

**Control Variables**

- Age
- Gender
- Ethnicity
- Energy intake.

**Description of Actual Data Sample:**

- *Initial N:* 8,229 adults (4,153 males, 4,076 females)
- *Attrition:* None
- *Age:* 20 years and older
- *Ethnicity:* US population study
- *Anthropometrics:* None

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- *Location:* United States.

**Summary of Results:**

Findings according to types of beans consumed vs. those who did not consume beans:

- For consumers of baked beans only (BB) there were no statistical differences between them and non-bean consumers for body weight, BMI, waist circumference or blood lipid levels
  - Adult BB consumers had lower SBP than non-consumers (120.4±1.4 vs. 123.3±0.4 P=0.19)
  - There were no significant (NS) differences in odds ratios for the various risk factors examined
- For consumers of variety beans VB vs. non-consumers there were statistical differences between them and non-bean consumers:
  - Body weights (77.1±1.2 vs. 80.4±0.3kg, P=0.004)
  - Waist circumferences (93.9±1.1 vs. 96.0±0.3, P=0.041)
    - 29% lower increased waist size risk (OR=0.71, (95% CI: 0.55,0.91) P=0.009 relative to non-consumers
- For consumers of variety beans and baked beans (VBBB) there were statistical differences between them and non-bean consumers in:
  - Body weight (77.5±1.1 vs. 80.5±0.3 P=0.008)
    - 22 % reduced risk of being obese (OR=0.78 95% CI: 0.64,0.97) P=0.026)
  - Waist size (94.2±1.0 vs. 96.1±0.3) P=0.043
    - 23 % reduced risk of increased waist size (OR=0.77; 95% CI: 0.62, 0.95; P=0.018)
- There were NS differences in odds ratios for most risk factors:
  - Elevated DBP (P=0.891)
  - Lower HDL-cholesterol (P=0.53)
  - Elevated LDL-cholesterol (P=0.540)
  - Elevated triglycerides (P=0.573)
  - Elevated fasting glucose (P=0.573)
- In the 20-40 age group there was a 47% reduced risk of elevated SBP (OR=0.53; 95% CI: 0.29, 0.96, P=0.037) in VBBB consumers relative to non-consumers.

**Other Findings**

- When categories were combined those who consumed beans had a higher intake of fiber, folate, iron and potassium. There were differences in vitamin C, sodium, calcium or vitamin E intake
- Those who consumed beans had a lower intake of $B_{12}$ and total fat, saturated fat and energy intake.

**Author Conclusion:**

Bean consumers have better overall nutrient intake, better body weights and waist circumferences and lower SBP when compared with non-consumers.

***Reviewer Comments:***

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- *It was clear from the article that the funders (Bush Brothers and Company) would have liked to identify baked beans alone, as a significant contributor to the positive effects identified. However, data appear to be reported honestly in that data for baked beans did not contribute to observed effects as powerfully as variety beans or the combination*
- *There was no comparison of data between groups in relation to types of beans consumed*
- *Data based on one 24-hour recall may have missed many "bean consumers" in the non-consumer group.*

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***Research Design and Implementation Criteria Checklist: Primary Research***

| **Relevance Questions** | | |
|---|---|---|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies) | Yes |

| **Validity Questions** | | |
|---|---|---|
| **1.** | **Was the research question clearly stated?** | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated? | Yes |
| 1.3. | Were the target population and setting specified? | Yes |
| **2.** | **Was the selection of study subjects/patients free from bias?** | Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | Yes |
| 2.2. | Were criteria applied equally to all study groups? | Yes |
| 2.3. | Were health, demographics, and other characteristics of subjects described? | Yes |
| 2.4. | Were the subjects/patients a representative sample of the relevant population? | Yes |

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| | | |
|---|---|---|
| **3.** | **Were study groups comparable?** | Yes |
| 3.1. | Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT) | N/A |
| 3.2. | Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline? | N/A |
| 3.3. | Were concurrent controls used? (Concurrent preferred over historical controls.) | N/A |
| 3.4. | If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis? | Yes |
| 3.5. | If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.) | Yes |
| 3.6. | If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")? | N/A |
| **4.** | **Was method of handling withdrawals described?** | N/A |
| 4.1. | Were follow-up methods described and the same for all groups? | N/A |
| 4.2. | Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.) | N/A |
| 4.3. | Were all enrolled subjects/patients (in the original sample) accounted for? | N/A |
| 4.4. | Were reasons for withdrawals similar across groups? | N/A |
| 4.5. | If diagnostic test, was decision to perform reference test not dependent on results of test under study? | N/A |
| **5.** | **Was blinding used to prevent introduction of bias?** | Yes |
| 5.1. | In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate? | N/A |
| 5.2. | Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.) | N/A |
| 5.3. | In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded? | Yes |
| 5.4. | In case control study, was case definition explicit and case ascertainment not influenced by exposure status? | N/A |

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| | | |
|---|---|---|
| 5.5. | In diagnostic study, were test results blinded to patient history and other test results? | N/A |
| **6.** | **Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?** | Yes |
| 6.1. | In RCT or other intervention trial, were protocols described for all regimens studied? | N/A |
| 6.2. | In observational study, were interventions, study settings, and clinicians/provider described? | Yes |
| 6.3. | Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect? | N/A |
| 6.4. | Was the amount of exposure and, if relevant, subject/patient compliance measured? | N/A |
| 6.5. | Were co-interventions (e.g., ancillary treatments, other therapies) described? | N/A |
| 6.6. | Were extra or unplanned treatments described? | N/A |
| 6.7. | Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups? | N/A |
| 6.8. | In diagnostic study, were details of test administration and replication sufficient? | N/A |
| **7.** | **Were outcomes clearly defined and the measurements valid and reliable?** | Yes |
| 7.1. | Were primary and secondary endpoints described and relevant to the question? | Yes |
| 7.2. | Were nutrition measures appropriate to question and outcomes of concern? | Yes |
| 7.3. | Was the period of follow-up long enough for important outcome(s) to occur? | N/A |
| 7.4. | Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures? | Yes |
| 7.5. | Was the measurement of effect at an appropriate level of precision? | Yes |
| 7.6. | Were other factors accounted for (measured) that could affect outcomes? | Yes |
| 7.7. | Were the measurements conducted consistently across groups? | Yes |
| **8.** | **Was the statistical analysis appropriate for the study design and type of outcome indicators?** | Yes |
| 8.1. | Were statistical analyses adequately described and the results reported appropriately? | Yes |
| 8.2. | Were correct statistical tests used and assumptions of test not violated? | Yes |

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| | | |
|---|---|---|
| 8.3. | Were statistics reported with levels of significance and/or confidence intervals? | Yes |
| 8.4. | Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)? | N/A |
| 8.5. | Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)? | N/A |
| 8.6. | Was clinical significance as well as statistical significance reported? | Yes |
| 8.7. | If negative findings, was a power calculation reported to address type 2 error? | N/A |
| **9.** | **Are conclusions supported by results with biases and limitations taken into consideration?** | Yes |
| 9.1. | Is there a discussion of findings? | Yes |
| 9.2. | Are biases and study limitations identified and discussed? | Yes |
| **10.** | **Is bias due to study's funding or sponsorship unlikely?** | ??? |
| 10.1. | Were sources of funding and investigators' affiliations described? | Yes |
| 10.2. | Was the study free from apparent conflict of interest? | ??? |

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